(19) Japan Patent Office (JP)
(12) Published Unexamined Patent Application (A)
(51) Int. Cl.[4] ID Code JPO File No.
B 27 K 3/16 BBC C-6754-2B

(11) Published Unexamined Patent Application No. S62-39201
(43) Provisional Publication Date: February 20, 1987

Number of Inventions: 1
Request for Examination: Not yet made
Total Pages: 4

(54) Title of the Invention: A method for manufacturing treated timber

(21) Patent Application No.: S60-180122
(22) Filing Date: August 15, 1985

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Specification

1. Title of the Invention

A method for manufacturing treated

2. Claims:

(1) A method for manufacturing treated timber having nonflammable inorganic compounds filtered and fixed into the tissues of said timber, wherein said nonflammable inorganic compounds are ultra micro particles of antimony oxide with 0.1μm or less in diameter; said timber is immersed in solution containing said ultra micro particles of antimony oxide dispersed therein in order for said ultra micro particles of antimony oxide to be filtered into said tissues; and said timber is dried in order to fix said ultra micro particles of antimony oxide in said tissues.

3. Detailed Explanation of the Invention

(Field of the Invention)

The present invention relates to a method for manufacturing treated timber having low flammability to timber.

(Background of the Invention)

As nonflammable or low flammable materials, the following are well known: wood wool cement board, calcium silicate board, and cement board. These materials are formed by mixing wood fiber or pulp as a filler with cement as a nonflammable material. Although they are nonflammable, their flexural strength, which is important for fixtures, is inferior to timber. To make timber low flammable while maintaining its flexural strength, one or more of the following water-soluble inorganic salts may be filtered into timber: diammonium phosphate, monoammonium phosphate, potassium carbonate, sodium carbonate, calcium chloride, magnesium chloride, and zinc chloride. Here, non-flammability means self-extinguishing, that is, timber cracks but neither ignites nor burns. There are some problems in this method, however, Diammonium phosphate and monoammonium phosphate, for instance, decompose at low salts. This tendency is especially strong in aqueous solution. They are therefore not suitable for high-temperature processing used for manufacturing fireproof materials. Furthermore, these phosphates are nutritional sources for wood-rotting fungi. An increased amount of those phosphates causes low prevention against putrefaction. Potassium carbonate and sodium carbonate absorb carbon dioxide in the air after processing to form dicarbonates; therefore those carbonates are inferior in terms of time-dependent stability.

Calcium chloride and magnesium chloride are highly absorbent, so much so that those chlorides accelerate the corrosion of metals and the propagation of wood-rotting fungi, thereby deteriorating the quality of timber. Zinc chloride is also highly absorbent. Although a mixture of those chemicals can compensate for weaknesses each other, it may be poor at water-resistance since those chemicals are water-soluble. Such a mixture is therefore not suitable for exterior materials. In other words, it can be used only in limited ways. Although it is possible to use organic chemicals including organic salts, there are also some problems in handling solvents, however.

(Purpose of the Invention)

Under the circumstances, the present invention provides a method for manufacturing treated timber characterized by stability and low flammability while maintaining flexural strength unique to timber.

(Disclosure of the Invention)

To realize the aforementioned purpose, the present inventors came up with the idea that inorganic ultra micro particles, which are insoluble in water and low in flammability, can be filtered into timber. In this manner, timber can be made low flammable while maintaining flexural strength unique to timber based on unique characteristics of inorganic substances such as non-flammability, non-absorbency, septic and insect-repellent qualities, and low flammable effects. All the traditional agents used for low flammability are filtered into timber as a solution; therefore methods of impregnation are relatively simple. The size of inorganic particles to be filtered into timber, however, is limited since they are insoluble in water. Since inorganic particles must be filtered into the gap sections of timber cells, their size must be small enough to pass through the pit membrane space. After due consideration, the present inventors found out that it was necessary to make the size of inorganic particles 0.1 μm or smaller, because the size of the pit membrane space is 0.1 μm on average. The present inventors searched for the type of inorganic particles that can be used to fulfill the purpose of the present invention to find out that antimony oxide is suitable. This is the way the present inventor came up with the present invention.

The present invention relates to a method for manufacturing treated timber by filtering and fixing nonflammable inorganic compounds into the cellular texture of timber. The present invention especially relates to a method for manufacturing treated timber characterized by the following processes: ultra micro particles of antimony oxide are used as the above-said nonflammable inorganic compounds that are 0.1 μm or smaller in diameter; timber is immersed in an aqueous solution in which said ultra micro particles of antimony oxide are dispersed in order to filter said ultra micro particles of antimony oxide into said timber tissues; and said timber tissues are dried so that said ultra micro particles of antimony oxide can be fixed in said timber tissues.

We will explain the present invention in more detail below.

The following is the method for manufacturing treated timber according to the present invention. First, we prepare an aqueous colloidal solution (an antimony oxide sol) in which ultra micro particles of antimony oxide are dispersed that is 0.1 μm or smaller in diameter. We may use ultra micro particles of antimony oxide with 0.02-0.05 μm in diameter. As an aqueous solution with dispersed particles, we may use a high concentration (e.g. about 48%). We may also choose antimony pentoxide (Sb_2O_5) as antimony oxide. Desired timber is immersed in said dispersed solution in order to filter the solution into the timber. As a result, ultra micro particles of antimony oxide are filtered into the gap sections of timber cells. Any method can be used for immersion including, but not limited to, a normal pressure processing method such as a soaking method, warm and cool bathing method, and diffusion method and pressurized processing methods such as a filling cell method, null cell method, and semi-null cell method. After that, the timber is removed from the solution and dried.

The timber treated by the abovementioned method is characterized by low flammability since antimony oxide is used that is nonflammable, nonabsorbent, and have antiseptic and insect-repellent qualities. Additionally, since this compound is insoluble in water, it cannot be eluted once it reaches the gap sections of cells. We can therefore provide treated timber that excels at water-resistance and low flammability. Furthermore, handling all the processes is easy since water is used as a solvent.

To improve low flammability, we may add a halogen type low flammable agent to said aqueous solution with dispersed antimony oxide. We may use NaCl, NaBr, or the like as a halogen type low flammable agent.

We will explain the present invention in more detail below.

(Working Example 1)

We used 200 weight % or more of an Agathis 1 mm veneer saturated with water as timber. As an solution with dispersed particles, we used a 48 weight % concentration of an antimony oxide sol (particle size: 0.02-0.05 μ m in diameter) made by Nissan Chemical Industries, Ltd.

Immerse said Agathis veneer in said dispersed solution. Allow it stand for 48 hours at normal temperature. Bathing ratio was 50-55. As a result, antimony oxide diffuses into timber. Dry it to the absolute dry state using a drier to make treated timber with an increase of 50-60 weight %.

We conducted low flammability tests on this treated timber according to JIS A 1322. The results were good.

(Working Example 2)

Prepare treated timber as in the example 1 using a solution dissolved with NaCl, a halogen type low flammable agent. The weight increase of the treated timber was the same as that in the example 1.

We conducted low flammability tests on the treated timber. The results were better than those in the example 1.

(Working Example 3)

We used NaBr as a halogen type low flammable agent. Other than that, everything else is the same as in the example 2. As a result, a concentration of NaBr in the dispersed solution increased up to 3-4 weight %. The weight increase of the treated timber was the same as that in the example 2.

We conducted low flammability tests on the treated timber. The results were better than those in the example 2.

(Working Example 4)

Use the method described in the example 1. First, make an Agathis veneer absolute dry. Immerse it in the dispersed solution. Degas it for 4 hours under reduced pressure (1 mm Hg). After that, pressurize it at 5-6 kg/cm^2 for 4 hours. The weight increase of the treated timber was the same as that in the example 1. The processing time was reduced.

We conducted low flammability tests on the treated timber. The results were good just as those in the example 1.

(Effects of the Invention)

The present invention relates to a method for manufacturing treated timber having nonflammable inorganic compounds filtered and fixed into the tissues of said timber. Said nonflammable inorganic compounds are ultra micro particles of antimony oxide with 0.1 μ m or less in diameter. The timber is immersed in solution containing said ultra micro particles of antimony oxide dispersed therein in order to filter said ultra micro particles of antimony oxide into said tissues. Then the timber is dried in order to fix said ultra micro particles of antimony oxide in the tissues. As a result, such treated timber could be provided as characterized by stability and low flammability while maintaining flexural strength unique to timber.

Agent: Takehiko Matsumoto, Patent Attorney

Amendment (Voluntary)

October 9, 1985

To: The Commissioner of the Japanese Patent Office (A seal appears here.)

1. Case Identification

Patent Application No. S60-180122

2. Title of the Invention

A method for manufacturing treated timber

3 Party Filing the Amendment

Relationship to the Case: Patent Applicant

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5. Number of the Invention Added by the Amendment

None (A stamp of JPO dated on Oct. 11, 1985 appears here.)

6. Parts Amended

Specification

7. Content of the Amendment

The "low salts" on page 2, line 18 of specification in Japanese should be amended to "low temperature."